Supplemental Table 1. Associations between PAH-related exposures and the risk of breast cancer *p53* mutation status subtype using referent groups of never smokers with low grilled/smoked meat intake[a,b]

Mutation status	Cases/controls	Age-adjusted OR (95% CI)	Multivariate-adjusted OR (95% CI)
Ever active smoking vs. never active smoking and low grilled/smoked meat intake[c]			
p53+ breast cancer	100/1225	0.85 (0.54, 1.32)	0.91 (0.58, 1.44)
p53- breast cancer	551/1225	1.33 (1.05, 1.69)	1.31 (1.03, 1.67)
Ratio of the ORs (*p53*+ vs. *p53*-)		0.64 (0.40, 1.01)	0.70 (0.43, 1.12)
Current active smoking vs. never active smoking and low grilled/smoked meat intake			
p53+ breast cancer	52/658	0.76 (0.41, 1.41)	0.87 (0.46, 1.63)
p53- breast cancer	288/658	1.43 (1.07, 1.92)	1.43 (1.06, 1.93)
Ratio of the ORs (*p53*+ vs. *p53*-)		0.53 (0.28, 1.01)	0.61 (0.32, 1.17)
Past active smoking vs. never active smoking and low grilled/smoked meat intake			
p53+ breast cancer	82/931	0.90 (0.56, 1.45)	0.98 (0.60, 1.59)
p53- breast cancer	400/931	1.30 (1.01, 1.68)	1.28 (0.99, 1.66)
Ratio of the ORs (*p53*+ vs. *p53*-)		0.70 (0.42, 1.15)	0.76 (0.46, 1.27)
High lifetime intake of smoked/grilled meat vs. low grilled/smoked meat intake and no active smoking exposure			
p53+ breast cancer	97/1103	1.06 (0.67, 1.67)	1.06 (0.67, 1.67)
p53- breast cancer	550/1103	1.61 (1.27, 2.05)	1.61 (1.27, 2.05)
Ratio of the ORs (*p53*+ vs. *p53*-)		0.66 (0.41, 1.06)	0.66 (0.41, 1.06)
High lifetime intake of grilled/smoked meat and current smoking vs. low intake and no active smoking exposure			
p53+ breast cancer	46/552	0.96 (0.46, 1.97)	0.96 (0.46, 1.97)
p53- breast cancer	224/552	1.57 (1.11, 2.23)	1.57 (1.11, 2.23)
Ratio of the ORs (*p53*+ vs. *p53*-)		0.61 (0.29, 1.29)	0.69 (0.32, 1.50)

OR: odds ratio; CI: confidence interval; B[*a*]P: benzo[*a*]pyrene; PAH: polycyclic aromatic hydrocarbon
a. In addition to adjustment for age group, final models were adjusted for daily alcohol intake when examining smoking exposure and age at menarche when examining PAH-DNA adducts.
b. Ratios of the ORs (OR for the association between exposure and *p53*+ breast cancer / OR for the association between exposure and *p53* – breast cancer), were calculated as indicators of heterogeneity of effects across groups.
c. Lifetime intake of grilled and smoked meat is dichotomized based on median lifetime servings among controls (median = 4160 servings).

Supplemental Table 2. Associations between PAH-related exposures and the risk of breast cancer *p53* mutation types using referent groups of never smokers with low grilled/smoked meat intake[a]

Mutation type	Cases/controls	Age-adjusted OR (95% CI)	Multivariate-adjusted OR (95% CI)
G:C>A:T at CpG transitions			
Active smoking vs. never smoking and low grilled/smoked meat intake[b]			
Never	4/367	1.0	1.0
Former	16/564	2.24 (0.73, 6.85)	2.27 (0.73, 7.06)
Current	6/291	2.36 (0.62, 8.93)	2.84 (0.73, 11.08)
High lifetime intake of grilled/smoked meat vs. low intake and never active smoking			
Low lifetime intake	4/367	1.0	1.0
High lifetime intake	21/736	2.68 (0.89, 8.09)	2.68 (0.89, 8.09)
High grilled/smoked meat intake and current active smoking vs. low intake and never active smoking			
Low, never	4/367	1.0	1.0
High, current	5/155	3.68 (0.89, 15.26)	4.24 (1.00, 17.94)
G:C>A:T at non-CpG transitions			
Active smoking vs. never smoking and low grilled/smoked meat intake			
Never	14/367	1.0	1.0
Former	14/564	0.61 (0.28, 1.32)	0.66 (0.30, 1.45)
Current	4/291	0.34 (0.11, 1.09)	0.43 (0.13, 1.39)
High lifetime intake of grilled/smoked meat vs. low intake and never active smoking			
Low intake	14/367	1.0	1.0
High intake	17/736	0.65 (0.31, 1.36)	0.65 (0.31, 1.36)
High grilled/smoked meat intake and current active smoking vs. low intake and never active smoking			
Low, never	14/367	1.0	1.0
High, current	1/155	0.15 (0.02, 1.21)	0.18 (0.02, 1.46)
Insertions/deletions			
Active smoking vs. never smoking and low grilled/smoked meat intake			
Never	5/367	1.0	1.0
Former	10/564	1.40 (0.46, 4.28)	1.39 (0.44, 4.38)
Current	7/291	2.45 (0.71, 8.42)	3.06 (0.87, 10.77)
High lifetime intake of grilled/smoked meat vs. low intake and never active smoking			
Low intake	5/367	1.0	1.0
High intake	16/736	1.79 (0.63, 5.07)	1.79 (0.63, 5.07)
High grilled/smoked meat intake and current active smoking vs. low intake and never active smoking			
Low, never	5/367	1.0	1.0
High, current	5/155	3.68 (0.87, 15.52)	4.49 (1.05, 19.25)

OR: odds ratio; CI: confidence interval; PAH: polycyclic aromatic hydrocarbons
a. In addition to adjustment for age group, final models were adjusted for daily alcohol intake when examining smoking exposure and age at menarche when examining PAH-DNA adducts.
b. Lifetime intake of grilled and smoked meat is dichotomized based on median lifetime servings among controls (median = 4160 servings).

Supplemental Table 3. Associations between PAH-related exposures and risk of breast cancer subtype as defined by p53 protein expression status in the Long Island Breast Cancer Study Project.[a, b]

Protein expression status	Cases/congrols	Age-adjusted OR (95% CI)	Multivariate-adjusted OR (95% CI)
PAH-DNA adducts (detectable vs. non-detectable)			
p53+ breast cancer	167/941	1.35 (0.92, 1.97)	1.35 (0.92, 1.97)
p53- breast cancer	324/941	1.25 (0.94, 1.67)	1.27 (0.95, 1.70)
Ratio of the ORs (p53+ vs. p53-)		1.08 (0.70, 1.65)	1.06 (0.69, 1.63)
Ever active smoking vs. never active smoking			
p53+ breast cancer	307/1556	1.03 (0.81, 1.33)	1.08 (0.84, 1.39)
p53- breast cancer	552/1556	1.10 (0.90, 1.35)	1.08 (0.88, 1.33)
Ratio of the ORs (p53+ vs. p53-)		0.94 (0.71, 1.25)	0.99 (0.74, 1.33)
Current active smoking vs. never active smoking			
p53+ breast cancer	200/989	1.15 (0.82, 1.61)	1.22 (0.87, 1.72)
p53- breast cancer	348/989	1.17 (0.89, 1.54)	1.15 (0.87, 1.52)
Ratio of the ORs (p53+ vs. p53-)		0.98 (0.67, 1.44)	1.06 (0.72, 1.57)
Past active smoking vs. never active smoking			
p53+ breast cancer	245/1262	1.00 (0.76, 1.33)	1.03 (0.77, 1.37)
p53- breast cancer	445/1262	1.07 (0.86, 1.34)	1.07 (0.85, 1.34)
Ratio of the ORs (p53+ vs. p53-)		0.94 (0.68, 1.29)	0.97 (0.70, 1.34)
Both active and passive smoking vs. never passive smoking or active smoking			
p53+ breast cancer	166/875	1.15 (0.75, 1.77)	1.23 (0.80, 1.91)
p53- breast cancer	315/875	1.51 (1.06, 2.15)	1.47 (1.02, 2.11)
Ratio of the ORs (p53+ vs. p53-)		0.76 (0.46, 1.25)	0.84 (0.51, 1.40)
Active smoking only vs. never passive or active smoking			
p53+ breast cancer	68/328	1.56 (0.90, 2.71)	1.71 (0.97, 3.01)
p53- breast cancer	98/328	1.22 (0.76, 1.97)	1.39 (0.85, 2.26)
Ratio of the ORs (p53+ vs. p53-)		1.28 (0.67, 2.43)	1.23 (0.64, 2.38)
Ever passive smoking only vs. never passive or active smoking			
p53+ breast cancer	132/681	1.14 (0.74, 1.76)	1.17 (0.75, 1.80)
p53- breast cancer	234/681	1.38 (0.96, 1.98)	1.38 (0.96, 1.99)
Ratio of the ORs (p53+ vs. p53-)		0.83 (0.50, 1.37)	0.84 (0.51, 1.40)
Ever passively exposed to spouse vs. never passively exposed to spouse			
p53+ breast cancer	239/1228	1.15 (0.86, 1.54)	1.15 (0.86, 1.55)
p53- breast cancer	454/1228	1.30 (1.03, 1.63)	1.30 (1.03, 1.63)
Ratio of the ORs (p53+ vs. p53-)		0.89 (0.64, 1.24)	0.89 (0.64, 1.24)
Lifetime intake of smoked/grilled meat (high vs. low)[c]			
p53+ breast cancer	293/1475	1.26 (0.97, 1.63)	1.26 (0.97, 1.63)
p53- breast cancer	530/1475	1.53 (1.24, 1.89)	1.53 (1.24, 1.89)
Ratio of the ORs (p53+ vs. p53-)		0.82 (0.61, 1.11)	0.82 (0.61, 1.11)
Total B[*a*]Ps from meat (high vs. low)[d]			
p53+ breast cancer	296/1473	1.10 (0.85, 1.42)	1.10 (0.85, 1.42)

p53- breast cancer	528/1473	1.05 (0.86, 1.29)	1.05 (0.86, 1.29)
Ratio of the ORs (p53+ vs. p53-)		1.04 (0.78, 1.40)	1.04 (0.78, 1.40)

OR: odds ratio; CI: confidence interval; B[*a*]P: benzo[*a*]pyrene; PAH: polycyclic aromatic hydrocarbon

a. In addition to adjustment for age group, final models were adjusted for daily alcohol intake when examining smoking exposure and age at menarche when examining PAH-DNA adducts.

b. Ratios of the ORs (OR for the association between exposure and *p53*+ breast cancer / OR for the association between exposure and *p53* – breast cancer), were calculated as indicators of heterogeneity of effects across groups. c. Lifetime intake of grilled and smoked meat is dichotomized based on median lifetime servings among controls (median = 4160 servings).

d. Daily intake of B[*a*]Ps from meat is dichotomized based on median daily intake among controls (median = 0.42 ng/day)